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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/749,917	12/29/2000	Christopher C. Chang	015290-458	6832

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BURNS DOANE SWECKER & MATHIS L L P
POST OFFICE BOX 1404
ALEXANDRIA, VA 22313-1404

EXAMINER
UHLIR, NIKOLAS J

ART UNIT	PAPER NUMBER
1773	5

DATE MAILED: 02/26/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/749,917	CHANG ET AL.	
	Examiner	Art Unit	
	Nikolas J. Uhlir	1773	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disp sition of Claims

4)☒ Claim(s) *1-31* is/are pending in the application.

4a) Of the above claim(s) *1-13* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *14-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-31* are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-13, drawn to a method of making a plasma reactor component, classified in class 427, subclass 447.

II. Claims 14-31, drawn to a component of a plasma reactor, classified in class 428, subclass 469.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product as claimed can be made by another and materially different process, such as vapor depositing the coating onto a plasma reactor component and roughening it chemically or through physical roughening with an abrasive.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Peter Skiff on 2/13/02 a provisional election was made with traverse to prosecute the invention of the product, claims 13-31. Affirmation of this election must be made by applicant in replying to this Office action.

Claims 1-13 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

a. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Specification

3. The disclosure is objected to because of the following informalities: ON page 10, lines 23-24 of the specification, the applicant refers to reference numeral 156 in figure 2 as both an antennae and an RF coil. It is not clear to the examiner whether the applicant is referring to reference number 156 as an antennae that is comprised of an RF coil, or if these are in fact two distinct parts. Clarification is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 14-22, 25-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shih et al. (US6120640) in view of Richardson et al. (US5916454) as evidenced by Wicker et al. (US5993594)

The limitation "a plasma sprayed coating" is a product-by-process limitation and is does not appear to be further limiting in so far as the structure of the product is concerned. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). See MPEP § 2113.

Shih et al. teaches a plasma etch reactor having interior components with surfaces facing the plasma wherein those components are comprised of bulk boron carbide or a coating of thermally sprayed boron carbide over a base material (Column 5, lines 16-21). These components include chamber walls, focus rings, and a gas distribution plate (columns 12 and 13, claims 18-21, and 24-25). Preferably, a component base, such as aluminum, is coated with a layer of thermally sprayed B_4C (column 5, lines 33-38). The thickness of the coating is typically between 5-10 mils (column 8, line 22). Although Shih et al. does not teach coating a component with the same material that makes up the component (for example a B_4C base coated with a layer of B_4C), the examiner takes the position that there is no functional difference between a plasma reactor part comprised of a single solid layer of material and a plasma reactor part that is coated with a layer, wherein the layer is made of the same material as the base onto which it is coated. Additionally Shih et al. teaches that components made of either bulk silicon nitride or a base coated with thermally sprayed

silicon nitride could be used as an alternative to boron carbide. Silicon nitride shares many of the erosion resistant qualities of boron carbide (column 10, lines 50-60). This coating is formed to provide increased durability to the plasma-exposed surfaces of interior components in plasma reactors (column 5, lines 14-15). Further Shih et al. teaches a method for processing a substrate in a plasma reactor containing the previously described parts. In this method, a plasma reactor containing a wall coated with a layer of plasma sprayed B_4C was used to etch aluminum. The etch recipe (process gas) included BCl_3, Cl_2, and Ar, and the inductively coupled plasma source power was 1500w, and the pedestal was biased with 145-200w of RF power column 11, lines 16-38). The B_4C component of this reactor could also be a wafer clamp, a plasma focus ring, a nozzle for processing gas, and a showerhead for processing gas (the gas distribution plate) (Column 13, claim 25). Further, Shih et al. teaches that there are three major types of plasma etching, each utilizing a similar reactor design, but each with their own preferred etching chemistry (column 1, lines 25-28). Metal etching, such as etching of aluminum, typically uses a chlorine based process gas as the etchant (column 1, lines 38-44). Etching of silicon however, typically uses hydrofluorocarbons such as C_2HF_5 and C_2F_6 as the processing gas, as evidenced by Wicker et al (Wicker et al. Column 3, lines 33-42 and column 4, lines 29-36). Thus, the type of process gas used is a results effective variable. It would be obvious to select the type of process gas used to match the substrate to be etched.

Shih et al. does not teach a plasma reactor component with coating that has surface roughness characteristics that promote adhesion of polymer deposits. Further,

Shih et al. does not teach a coated plasma reactor component that has an arithmetic mean surface roughness value from 150-190 micro inches.

Richardson et al. teaches a method for manufacturing a plasma reactor chamber part, wherein the part is roughened to promote the adhesion of byproduct particles to the surface of the part (column 2, lines 25-33). This technique can be applied to any interior component of a plasma reactor chamber that is suitable for roughening (column 4, lines 29-34). Byproduct deposits typically of concern include silicon, silicon oxide and other carbon-based polymers (column 5, lines 5-11). Richardson et al. discloses that plasma reactor components are typically manufactured to maximize their smoothness, because this allows for a tight seal with other parts, easy cleaning, and low moisture absorption. However, this leads to increased particle contamination (column 5, lines19-35). The amount of particle contamination is reduced by roughening the surface of a chamber component, thereby increasing the adherence of byproduct particles to the component surface (column 5, lines 43-48). Thus, the surface roughness of a plasma reactor interior component is a results effective variable. One would roughen the surface to improve byproduct adhesion, and one would smooth the surface to promote easy cleaning and low moisture absorption. Therefore, it would be obvious to optimize the roughness of the interior components to the range specified in order to achieve the desired adhesion of byproduct particles. The minimum roughness specified by Richardson et al. is typically greater than 2 micro inches (column 2, lines 60-53).

Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to impart the rough surface taught by Richardson et al. to the boron carbide coated reactor chamber components disclosed by Shih et al.

One would have been motivated to make this modification due to the increase in byproduct particle adhesion to the interior components one would expect to gain as a result.

6. Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shamouilian et al (US2001/0003298A1) in view of Richardson et al.

Shamouilian et al. teaches a support for a substrate that is used while a substrate is processed in a plasma-processing chamber. This support comprises a dielectric covering a primary electrode, the dielectric having a surface for receiving the substrate thereon (page 2, section 28). The dielectric comprises a single layer insulating material overlying the base. This dielectric can be a polymeric material such as a polyimide (page 3, section 30). The thickness of the dielectric material is typically 100-1000μm (3-40mils).

Shamouilian et al. does not teach roughening the surface of the dielectric material to promote the adhesion of polymer deposits.

Richardson et al. teaches a method for manufacturing a plasma reactor chamber part, wherein the part is roughened to promote the adhesion of byproduct particles to the surface of the part (column 2, lines 25-33). This technique can be applied to any interior component of a plasma reactor chamber that is suitable for roughening (column 4, lines 29-34).). Richardson et al. discloses that plasma reactor components are

typically manufactured to maximize their smoothness, because this allows for a tight seal with other parts, easy cleaning, and low moisture absorption. However, this leads to increased particle contamination (column 5, lines19-35). The amount of particle contamination is reduced by roughening the surface of a chamber component, thereby increasing the adherence of byproduct particles to the component surface (column 5, lines 43-48).

Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to impart the rough surface described by Richardson et al. to the polyimide layer disclosed by Shamouilian et al.

One would have been motivated to make this modification due to the decrease in particle contamination of the substrate one would expect to gain as a result.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikolas J. Uhlir whose telephone number is 703-305-0179. The examiner can normally be reached on Mon-Fri 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Thibodeau can be reached on 703-308-2367. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-0389.

nju
February 20, 2002

Paul Thibodeau
Supervisory Patent Examiner
Technology Center 1700